Geomagnetic Observatory Gan

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GEOMAGNETIC OBSERVATORY GAN

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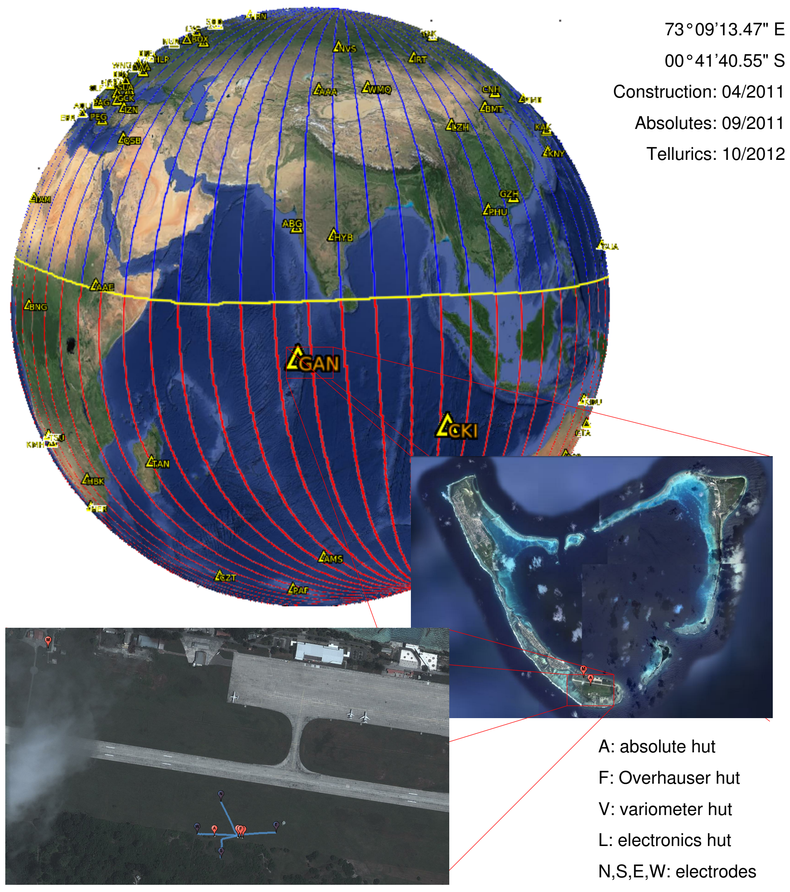
Observatory location



73°09'13.47" E
00°41'40.55" S
Construction: 04/2011
Absolutes: 09/2011
Tellurics: 10/2012

A: absolute hut
F: Overhauser hut
V: variometer hut
L: electronics hut
N,S,E,W: electrodes
M: MetOffice

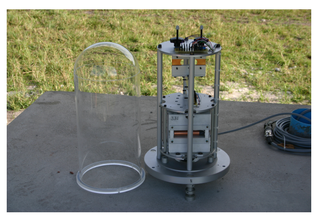
Construction and instruments

concrete pillars 50 cm above ground level
semi–open huts with E–W concrete block and glassfiber roofs
glassfiber covers with styrofoam insulation, temperature and humidity monitoring
underground plastic cable ducts
autonomous power supply: 130 W solar panel, lead–acid batteries, voltage monitoring
mini PC on site, WiFi link to MetOffice

MINGEO 020 declinometer/inclinometer
(Zeiss THEO 020 + fluxgate DMI Model G FGM)

suspended DMI FGM–FGE fluxgate variometer
HDZ orientation

Gemsys GSM–90F1 Overhauser magnetometer



LEMI417E telluric instrument
$Pb–PbCl_2$ electrodes, Oregon State University
electrode spacing: N–S 146 m, E–W 200 m

Fluxgate, Overhauser, and telluric signals sampled and recorded at 1 s rate
Minute mean data computed on site by standard Intermagnet (90 second Gaussian) filter
Data transmitted every 10 minutes using WiFi link to MetOffice
Local backups at MetOffice and ETH servers
After screening and peak removal, data sent to Edinburgh GIN
Absolute measurements performed weekly
Observatory homepage: http://koblizek.ethz.ch/gan.html
Quicklook at GAN, CKI, API magnetograms: http://koblizek.ethz.ch/show/

Future plans

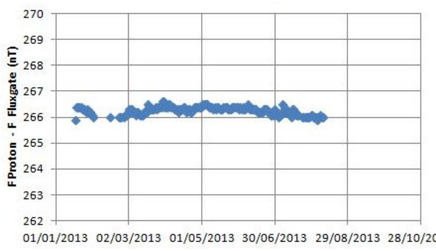
Sustained operations at least for the duration of the Swarm mission and hopefully beyond
Gradual transfer of data processing knowledge and responsibilities to local staff
Additional electrodes of different type and positioning for telluric measurements
Intermagnet application pending

Baseline stability

Baselines of H, D, and Z components for 2013 have stabilized after replacement of the variometer on January 15, 2013

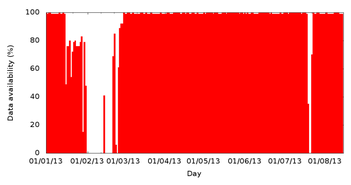
The closing error (difference between Overhauser measurement and baseline corrected fluxgate data) is also stable (shown in red)

Stability of absolute measurements



Difference between Overhauser data and amplitude obtained from the absolute measurements inidcates good absolute observations and absence of external interference due to movements of magnetic objects near the site

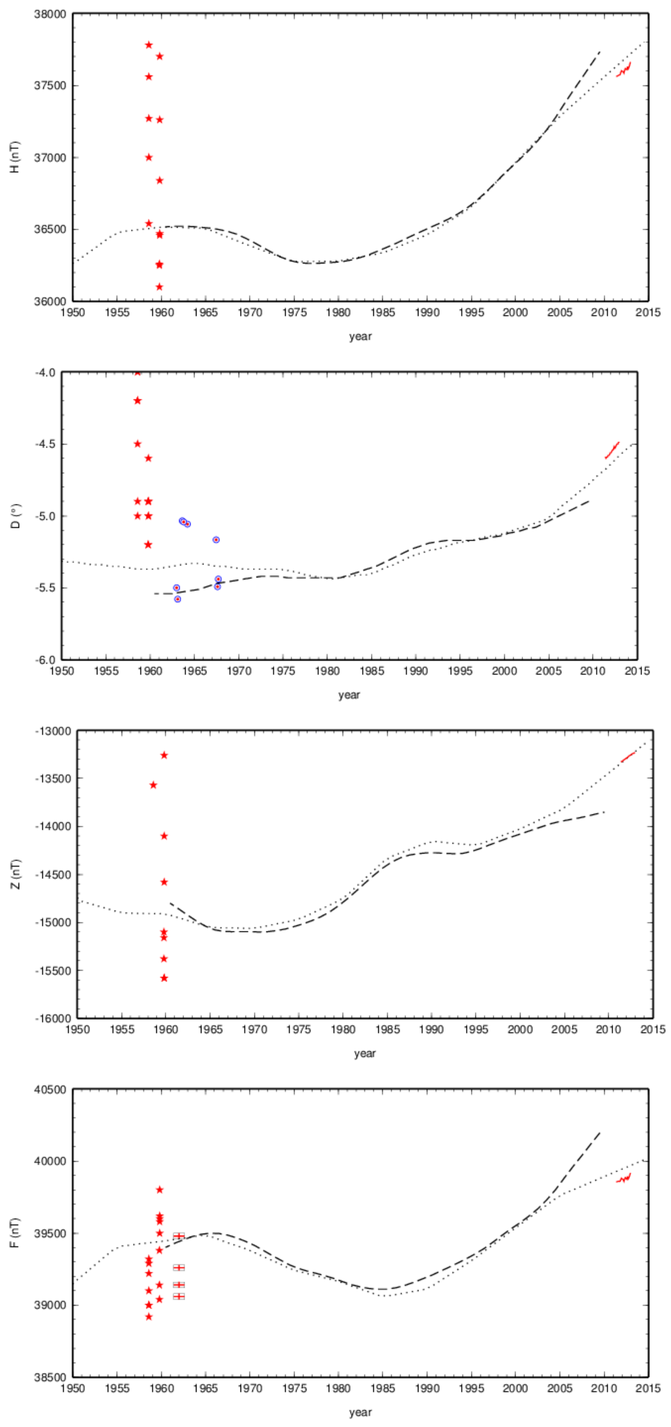
Data availability in 2013

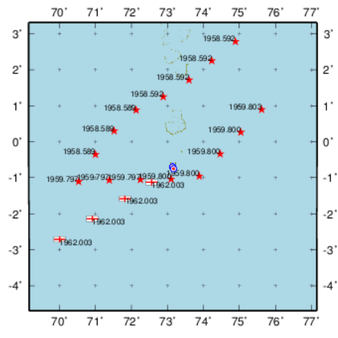


Various problems and solutions

Interference between solar charger and GSM90:
DC–DC filter installed in 2011
Temperature stability vs. humidity in the V hut:
Large cover with a single styrofoam layer
Variometer drift and unstable baselines:
New variometer installed in 01/13
Regular grass cutting at the airport
Peak removal from data; repair of cut cables

Secular variation





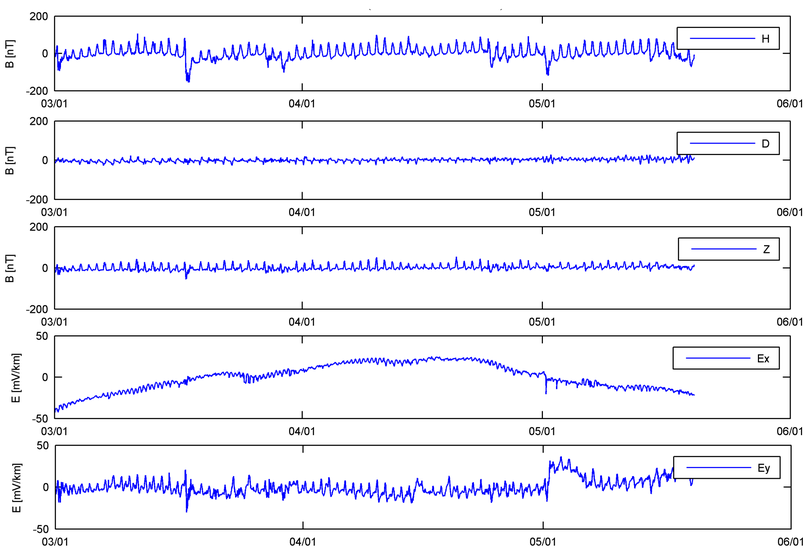
GAN monthly means
October 2011 – June 2013
Global magnetic field models
CM4 (Sabaka et al. 2004)
IGRF11 (Finlay et al. 2010)
Historic surveys
Survey ship Zarya, 1958–9
HMS Owen, 1962
RAF base GAN, 1963, 1967

Concluding Remarks

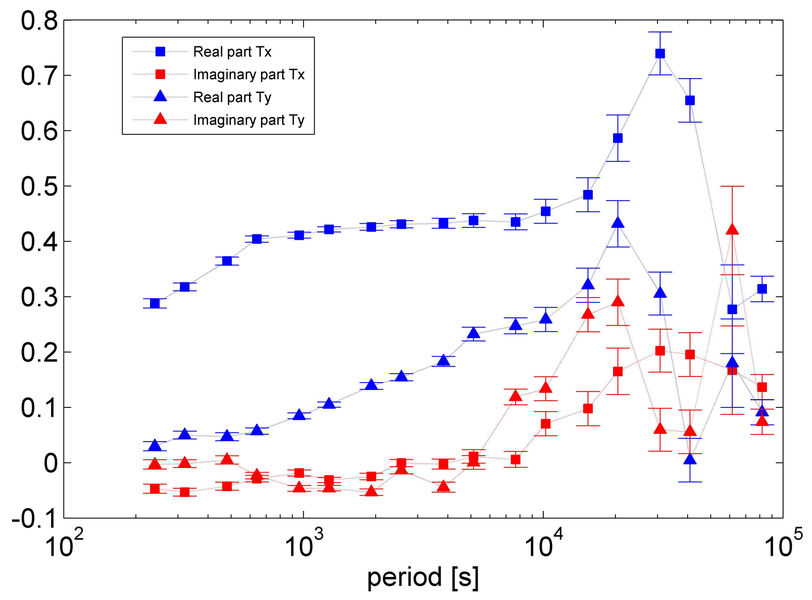
Differences between IGRF11 and actual data up to 100 nT in H, and 0.1° in D

Preliminary EM induction analysis

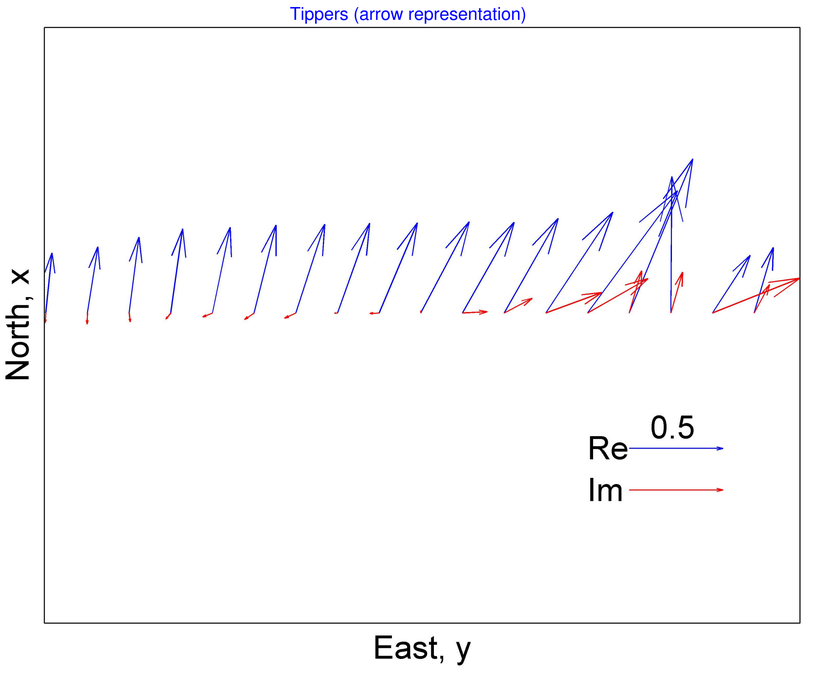
Minute means of magnetic and horizontal electric fields, March–June 2013



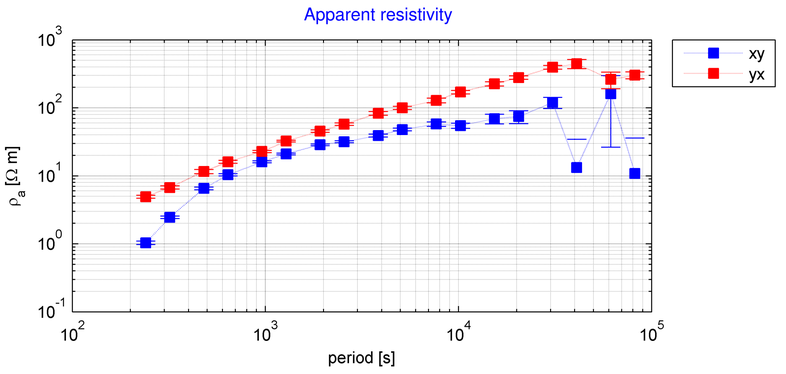
Tippers



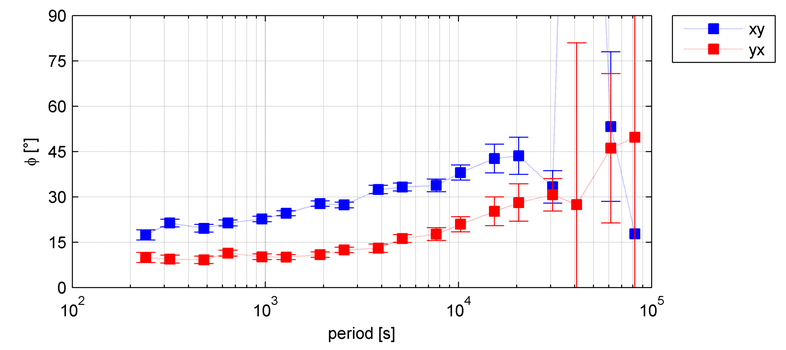
Tippers (arrow representation)



Apparent resistivity



Phase



Concluding Remarks

Minute means processed by BIRRP (Chave & Thomson, 2003)
Stable B–field data
Ex component is less stable, has smaller dynamic range and larger drift than Ey
Tippers are stable for periods up to 3 hours, distorted by source effect for longer periods
Tippers point away from the deep conductive ocean
Apparent resistivities are stable for periods up to 8 hours,
distorted by source effect for longer periods
Lower stability and signal to noise ratio of Ex component
increase the scatter of xy apparent resistivity